

## Claims

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1. A method of aseptically filling an internally sterilised sealed container having a transfer port which comprises a tubular body which is sealed to the wall of the container and defines a flow passage therethrough, and a sealing plug engaged into the passage, the tubular body having an annular outer sealing face thereon which surrounds the flow passage, the method comprising the steps of:

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- supporting the tubular body of the container in a selected orientation and position;
  - providing a sterilisation and filling head having at least an outer sealing ring thereon which is adapted to engage and seal with the annular sealing face, and a sterilisation chamber located within the outer sealing ring;
  - 10 • bringing the sterilisation and filling head and the tubular body into engagement with each other so that the outer sealing ring engages and seals with the annular sealing face;
  - introducing a sterilisation fluid into the sterilisation chamber to sterilise at least the radially outer part of the plug and that part of the tubular body within the outer sealing ring;
  - 15 • withdrawing the plug out of the tubular body in a direction away from the container whilst maintaining the sealing ring in sealed contact with the sealing face;
  - introducing a flowable material into the container through the tubular body;
  - reinserting the plug into the tubular body to thereby close the tubular body; and
  - disengaging the sterilisation and filling head and the tubular body from each other.

2. A method as claimed in claim 1, wherein said method includes the steps of:

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- providing the sterilisation and filling head with an inner sealing ring which is co-axial with the outer sealing ring, the sterilisation chamber being formed in the annular space between the two sealing rings;
  - providing a plug with an annular sealing face thereon which is co-axial with the annular sealing face on the tubular body and is adapted to be engaged by the inner sealing ring;
  - 25 • bringing the sterilisation and filling head and the tubular body into engagement with each other so that the outer sealing ring engages and seals with the annular sealing face on the body, and the inner sealing ring engages and seals with the annular sealing face on the plug; and
  - introducing the sterilisation fluid into the annular sterilisation chamber.

3. A method as claimed in claim 1 or 2, wherein the method includes the steps of:

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- providing a gripping jaw on the sterilisation and filling head within the outer sealing ring; and
  - gripping the plug with the gripping jaw in order to withdraw the plug from the tubular body.

4. A method as claimed in any one of claims 1 to 3, wherein said method includes the steps of:

- maintaining the outer sealing ring in sealing engagement with the annular sealing face on the body, and the inner sealing ring in sealing engagement with the sealing face on the plug;
- gripping the plug with the gripping jaws; and

- extracting the plug from the tubular body whilst maintaining the inner sealing ring in sealing engagement with the sealing face on the plug.
5. A method as claimed in any one of claims 1 to 4 wherein the method includes the steps of:
- partially inserting the plug into the tubular body;
- 5 6. • cleaning the peripheral outer surfaces of the plug prior to fully inserting the plug into the tubular body; and
- fully inserting the plug into the tubular body.
6. A method as claimed in any one of claims 1 to 5, wherein the step of cleaning the peripheral outer surfaces of the plug is achieved by introducing a sterilisation fluid into the sterilisation chamber with the plug partially inserted into the flow passage in the tubular body.
- 10 7. A method as claimed in any one of claims 1 to 6, wherein the method includes the steps of sealing the plug to the tubular body during or after the plug has been reinserted into the tubular body.
- 11 8. A method as claimed in claim 7, wherein the sealing is achieved by welding the plug in to the tubular body.
- 12 9. A method as claimed in claim 8, wherein the welding is done using one of the following: high temperature sterilisation fluid; steam.
- 13 10. A sterilisation and filling apparatus for aseptic filling of sterile containers having a filling nozzle comprising a tubular body with a flow passage therethrough and a plug for closing the flow passage, at least the tubular body having an annular sealing face thereon, the apparatus comprising:
- holding means for holding the container and/or the tubular body in a selected position;
  - a sterilisation and filling head having at least an outer annular sealing ring adapted to engage the annular sealing face on the tubular body, the sterilisation and filling head having a sterilisation chamber located inwards of the outer sealing ring, the sterilisation and filling head having a cavity therein adapted to receive the plug of a container to be filled, the sterilisation and filling head and/or the tubular body being movable towards and away from the other;
  - sterilisation fluid supply means adapted to supply sterilisation fluid to the sterilisation chamber;
  - a plug extractor adapted to extract a plug from the tubular body and move the plug into the cavity in the sterilisation and filling head; and
  - filling means adapted to fill the container through the sterilisation and filling head when the plug has been extracted.
- 15 11. A sterilisation and filling apparatus as claimed in claim 10, wherein the sterilisation and filling head includes an inner sealing ring which is co-axial with said outer sealing ring and spaced inwardly therefrom to define an annular space therebetween, said annular space forming said sterilisation chamber, said inner sealing ring being engageable with a sealing face provided on the plug.
- 20 12. A sterilisation and filling apparatus as claimed in claim 10 or 11, wherein the plug extractor may comprise one or more gripping jaws adapted to grip the plug and extract it from the tubular body into the cavity.
- 25 13. A sterilisation and filling apparatus as claimed in claim 12, wherein the jaws may be mounted to a ram which is moveable in an axial direction towards and away from the plug, the jaws being moveable between gripping and release positions.
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14. A sterilisation and filling apparatus as claimed in claim 12 or 13, wherein the jaws automatically move to a gripping position when the ram moves in a direction away from the plug, and move into the release position when the ram moves towards the plug.
- 5 15. A sterilisation and filling apparatus as claimed in any one of claims 12 to 14, wherein the ram may be adapted to drive the plug into the tubular passage after the container has been filled.
16. A sterilisation and filling apparatus as claimed in any one of claims 10 to 15, wherein the sterilisation and filling head is adapted to shut off the flow of filling material into the container prior to the plug being fully inserted into the tubular passage.
- 10 17. A sterilisation and filling apparatus as claimed in any one of claims 10 to 16, wherein said sterilisation and filling head is adapted to clean the plug with sterilisation fluid when the plug is partially re-inserted back into the tubular passage.
18. An aseptic container adapted to be filled with a flowable material, the aseptic container having a filling opening comprising a tubular body having a flow passage therethrough, and a plug for sealing the flow passage, the plug having gripping formations on the outer face thereof, and retaining means or locking formations thereon for operatively or cooperatively locking the plug into the flow passage.
- 15 19. An aseptic container as claimed in claim 18, wherein said gripping formations will allow the application of an axially directed force to be applied to the plug to remove or re-install the plug into the filling opening.
20. An aseptic container as claimed in claim 18, wherein the gripping formations will allow the applications of a rotational force to be applied to the plug to remove or re-install the plug into the filling opening.
21. An aseptic container as claimed in any one of claims 17 to 20, wherein the plug is removed and reinstalled into said opening by axial means, preferably of a slide or interference fit.
- 25 22. An aseptic container as claimed in any one of claims 17 to 20, wherein said plug and opening include a screw thread or cam or bayonet locking means.
23. An aseptic container as claimed in any one of claims 17 to 22, wherein the plug is cup shaped having an end wall and a cylindrical skirt depending from the end wall, the end wall adapted to be outermost when the plug is inserted into the flow passage.
24. An aseptic container as claimed in claim 23, wherein gripping formations are formed on the end wall and project in a direction which is opposite to that in which the skirt extends from the end wall.
- 25 25. An aseptic container as claimed in claim 24, wherein said gripping formations may take the form of a head which stands proud of the end wall.
- 30 26. An aseptic container as claimed in claim 25, wherein said head is undercut to provide purchase for the gripping jaw which is adapted to extract the plug from the flow passage.
27. An aseptic container as claimed in any one of claims 18 to 26, wherein said locking formations may comprise a radially outwardly projecting annular rib formed on the plug, said rib being adapted to locate behind a shoulder, end face or within a groove formed in or adjacent the flow passage.
- 35 28. An aseptic container as claimed in any one of claims 18 to 27, wherein said flow passage and/or the plug have an annular seal therein adapted to seal with a plug inserted into the annular passage.
29. An aseptic container as claimed in any one of claims 18 to 28, wherein the plug and/or the tubular body are formed of a thermoplastic material adapted to bond together under temperatures of between about 130°C and 180°C.

30. An aseptic container as claimed in any one of claims 18 to 29, wherein the plug and the tubular body are sealed together during manufacture.
31. An aseptic container as claimed in claim 30, wherein said seal is mechanically rupturable.
32. An aseptic container as claimed in claim 30, wherein said seal is adapted to be weakened under temperatures of between about 130°C and 180°C thereby providing an arrangement for simplified extraction of the plug after it has been sterilised by a high temperature sterilisation fluid.
- 5 33. A plug and gland port for use on an aseptic container, said port comprising:  
a tubular body having a flow passage therethrough defined by a cylindrical inner wall of the tubular body, and  
a plug for sealing the flow passage, the plug having gripping formations on the outer face thereof, and retaining means or formations thereon for locking the plug into the flow passage.  
10 said retaining means comprising an annular recess formed around the periphery of the plug, and an annular rib or lip formed around and standing proud of the cylindrical inner wall of the tubular body, the rib or lip being adapted to locate in the recess to form a locating and/or sealing engagement with the recess when the plug is operatively installed within the tubular body.
- 15 34. A plug and gland as claimed in claim 33, wherein the annular recess on the plug is at least partially filled with a sealing ring.
35. A plug and gland as claimed in claim 33 or 34, wherein said sealing ring is a low melt sealant deposited in said recess.
36. A plug and gland as claimed in claim 35, wherein the rib or lip on the cylindrical inner wall is spaced a first distance away from the operatively outer end face of the tubular body.
- 20 37. A plug and gland as claimed in any one of claims 33 to 36, wherein the annular recess on the plug is spaced a second distance away from the operatively outer end face of the plug, said second distance being less than said first distance.
38. A plug and gland as claimed in any one of claims 33 to 37, wherein said plug has a second annular recess formed around the periphery thereof, said second annular recess being spaced from the first annular recess, the second annular recess being spaced a distance away from the operatively outer end face of the plug by a distance which is substantially the same as the distance which the rib or lip is spaced away from the operatively outer end face of the gland so that when the rib or lip is located within the second annular recess the operatively outer end faces of the gland and the plug are substantially flush with each other.
- 25 39. A plug and gland as claimed in claim 39 whereby prior to filling the container the gland and plug are welded together.
40. A plug and gland, as claimed in any one of claims 33 to 39, wherein said rib or lip has a generally triangular form in cross section so as to provide a chamfered or bevelled face in both an outwardly facing direction and an inwardly facing direction to allow for simplified engagement and disengagement of the plug with the gland.

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